

The Influence of Personalized AI on Consumers' Engagement in E-commerce among Generation Z in Penang

Yeo Zi Xwan ¹, R. Chandrashekar ^{1*}

¹ Department of Management and Technology, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Johor, 86400, MALAYSIA

*Corresponding Author: chandra@uthm.edu.my

DOI: <https://doi.org/10.30880/rmtb.2026.07.01.017>

Article Info

Received: 31 March 2026

Accepted: 31 May 2026

Available online: 30 June 2026

Keywords

Artificial intelligence, personalized AI, generation Z, consumers' engagement

Abstract

The rise of artificial intelligence (AI) has reshaped the mechanisms of consumer interaction and strategic decision-making in e-commerce. This shift is particularly relevant among Generation Z in Penang, Malaysia who are active digital users and potential online shoppers. This study is to identify the influence of personalized AI on consumers' engagement in e-commerce among generation Z in Penang. The research investigated the influence of AI networking recommendation, AI personalized feed, and AI quality on consumers' engagement in e-commerce platforms. This research adopted a quantitative research design, collecting data from 384 Generation Z respondents in Penang using convenience sampling. The collected data analyzed by Statistical Package for Social Sciences (SPSS), conducted empirical analysis using 317 valid questionnaires included descriptive analysis, normality test and correlation analysis. Researcher found that the AI quality can significantly influences Gen Z consumers' engagement in e-commerce. These results can guide digital marketers and e-commerce platforms to optimize AI personalization strategies and build consumer trust effectively.

1. Introduction

The global e-commerce surge has fundamentally reshaped consumer-brand interactions, transforming multilingual customer reviews into 'priceless' strategic assets for sentiment analysis (Prova *et al.*, 2026). This data-driven evolution mirrors a broader corporate paradigm where data is recognized as an organization's most vital asset (KPMG, 2019). Modern AI facilitates this transition by replacing static, rule-based campaigns with real-time, personalized experiences. Such precision effectively mitigates 'choice paralysis,' a phenomenon causing nearly 40% of consumers to abandon platforms due to information overload (BigCommerce, 2021).

AI technologically mimics human intelligence through cognitive subsets like Machine Learning (ML) and Natural Language Processing (NLP), evolving from back-end analytical tools to front-end creative collaborators (Lim *et al.*, 2024; IONIȚĂ *et al.*, 2025). In advertising, AI optimizes four core functions include targeting, personalization, content generation, and real-time delivery which significantly boosting consumer engagement and ROI (Gao *et al.*, 2023; Pendyala & Lakkamraju, 2024).

Furthermore, AI-driven predictive analytics foster a 'customer-centric' paradigm, strengthening the psychological bond between consumers and platforms (Attar, 2025; Hassan *et al.*, 2025). With the AI retail market projected to reach USD 31 billion by 2028, 63% of shoppers already recognize the value of AI-tailored recommendations (Statista, 2025). Empirical evidence from platforms like Douyin confirms that personalized feeds effectively drive purchase intentions (Ding *et al.*, 2024).

Customer engagement has evolved into a strategic orchestration of positive experiences across the entire customer journey (O'Brien & Downie, 2024). Modern AI-driven approaches have shifted engagement from passive

transactions to a multidimensional model centered on predictive assistance and emotional resonance (Woolard, 2025). This alignment is most critical for Gen Z, a digital-native cohort that prioritizes brand experience as highly as product quality, necessitating AI-driven precision to foster long-term loyalty (Merge, 2024).

Despite AI's transformative role in reshaping marketing strategies through adaptive, data-driven recommendations (Ziakos & Vlachopoulou, 2023), a significant misalignment persists between AI performance and Generation Z's expectations. In Malaysia's rapidly expanding e-commerce market projected to reach USD 8.95 billion by 2025 (Statista Market Forecast, 2024). Gen Z's behavior is driven by emotional triggers like instant gratification from personalized short-form videos (Ngo *et al.*, 2025).

However, ineffective personalization often results in advertisement fatigue and diminished engagement. Notably, while AI-personalized feeds can boost purchase intentions, AI-networking recommendations frequently fail to yield significant effects (Sidharta *et al.*, 2024). This gap is further widened when users lack control over algorithm-driven outputs, preventing sustained engagement despite hedonic triggers (Rahayu *et al.*, 2025).

Trust also remains a critical barrier, high perceptions of privacy invasion significantly inhibit clicking intentions despite enhanced user experiences (Yin *et al.*, 2025). Currently, only 16% of Gen Z consumers trust AI-generated suggestions, with 67% citing data privacy as their primary concern for brand trust (PwC, 2024). Furthermore, the barrage of AI-curated content often leads to cognitive fatigue and decision paralysis. Statistics show that 37% of adults aged 18-40 feel overwhelmed by digital management, while 53% struggle to limit screen time, highlighting the risk of excessive digital noise (Deloitte, 2023; Wang *et al.*, 2025).

Despite extensive global research, empirical evidence regarding the impact of AI personalization on Malaysian Gen Z consumers, particularly in localized urban contexts like Penang, remains scarce. Most findings are based on Western or developed Asian markets, which may not be generalizable to Malaysia. This underscores a pressing need for geographically contextualized research to accurately capture consumer behavior in specific regional settings (Abbas *et al.*, 2020).

Therefore, to achieve the research objectives the level of Gen Z engaging in personalized AI elements in e-commerce are determined. Furthermore, the level of Gen Z consumers' engagement in e-commerce also determined. Consequently, the relationship between personalized AI elements and Gen Z consumers' engagement in e-commerce is identified.

2. Literature Review

2.1 Personalized AI

AI-powered personalization has evolved from simple recommendations into a sophisticated governance mechanism. Utilizing big data and predictive algorithms, these systems demonstrate high behavioral elasticity in consumer spending by tailoring content in real-time based on contextual data (Turki, 2025; Qadri *et al.*, 2026). This technology functions as a design lever that shifts consumer processing from cursory scanning to effortful evaluation. A distinct advantage is AI perceived "commercial neutrality"; consumers often view algorithms as unbiased, unselfish partners compared to commission-driven human agents, thereby enhancing hedonic well-being and engagement authenticity (Liu *et al.*, 2026).

Despite these benefits, hyper-personalized mechanisms introduce a "privacy-personalization paradox," where convenience must be balanced with ethical transparency to mitigate consumer skepticism and "creepy" perceptions (Rahman, 2026). Modern systems have transitioned into context-based frameworks by integrating ANN, CNN, and generative Large Language Models (LLMs) to achieve dynamic adaptivity. This enables e-commerce platforms to move beyond static profiling, utilizing real-time environmental cues to deliver highly precise, contextually relevant experiences (Liu *et al.*, 2025).

2.2 The Importance of Personalized AI

AI surpasses traditional marketing by offering superior analytical insights, operational efficiencies, and significant cost savings (Tauheed *et al.*, 2024). In global e-commerce, AI-driven personalization (AIP) ensures cultural authenticity by tailoring messages to local values, thereby enhancing decision making efficiency and minimizing consumer search costs (Priporas *et al.*, 2025; Gao & Liu, 2023). Unlike conventional methods, AIP's predictive capacity identifies pre-purchase needs and secures post purchase loyalty through customized engagement.

Furthermore, AI bridges the gap between technology and emotional resonance, fostering "affective attachment" through tailored social support that reduces purchase uncertainty (Bilal *et al.*, 2024). Due to its perceived objectivity and lack of commercial bias, consumers increasingly trust AI recommendations over human influencers, particularly in rational decision-making sectors like electronics (Gerlich, 2025). This shift transforms AI from a functional tool into a trusted partner that drives purchase intentions through data-driven confidence.

2.3 Generation Z

Gen Z, born between 1997 and 2012, is redefining workforce values with a focus on instant connectivity, personalization, mental health and authentic leadership in inclusive teams (Swaminathan, 2022). Deloitte (2025) reports that 31% of Gen Z prefer vocational training over traditional university education, emphasizing work-life balance and meaningful careers. In Penang, the 15-29 age group which used as a proxy for Gen Z makes up about 35% of the population (Penang Institute, 2024).

This generation favors immediate gratification and interactive online shopping, prioritizing product quality, ethical values and brand authenticity over discounts (Arghashi & Gunalay, 2025; Dragolea *et al.*, 2023). Other than that, trust and loyalty are linked to verified sustainability practices (Theocharis & Tsekouropoulos, 2025). Besides, unlike Millennials, Gen Z rejecting traditional consumption models and values for flexibility, personal growth, adaptability and personalized brand experiences (Hovořáková & Pauknerová, 2024).

2.4 Relevance of Personalized AI to Gen Z

As the first true digital natives, Generation Z's behaviors are fundamentally shaped by an environment of pervasive online platforms (Holban & Bedrule-Grigoruță, 2025); Prensky, 2001). Characterized by high "personal innovativeness," this cohort is more receptive to sophisticated AI than older generations, driven primarily by "performance expectancy" and "hedonic motivation" valuing both functional efficiency and emotional enjoyment (Herzallah *et al.*, 2025). Research indicates that algorithm-driven recommendations, such as those on TikTok, significantly enhance content relevance, thereby boosting engagement and satisfaction (Guo & Luo, 2023; Trang *et al.*, 2025).

Furthermore, Gen Z prioritizes hands-free, multi-tasking interactions via Intelligent Personal Assistants (IPAs), reflecting a pragmatic acceptance of emotion-monitoring and data-intensive surveillance in exchange for personalized convenience (Guo & Luo, 2023; Ho *et al.*, 2022). However, a critical "privacy-personalization" balance remains; while Gen Z demands 24/7 responsiveness as a natural extension of their digital existence, their engagement is strictly contingent upon "trust" and the confidentiality of personal information (Joshi, 2025; Suganya *et al.*, 2020).

2.5 Consumers' Engagement

Consumer engagement is conceptualized as a multidimensional psychological state comprising cognitive, emotional, and behavioral components that reflect a consumer's investment in their interaction with a brand or technology (Cao *et al.*, 2025). Furthermore, consumer engagement functions as a pivotal mediator, bridging the gap between AI technological attributes and the user's ultimate purchase intention. By fostering a sense of social presence, personalized AI can deepen emotional engagement, particularly among digital-native cohorts who value interactive and socially attractive AI interfaces (Jayasingh *et al.*, 2025).

2.6 AI Networking Recommendation

AI networking recommendations personalize suggestions by analyzing user behavior and social trust. Zhang *et al.* (2019) highlight the importance of combining social influence and personalized content for effective recommendations. Kim and Im (2025) found that users who understand AI systems feel more control, increasing their engagement and intention to interact with AI advertisements. This interaction helps explain how personalized AI advertisements affect Gen Z's online shopping intentions.

2.7 AI Personalized Feed

Yin & Qiu (2021) found that AI-powered personalized recommendations enhance both hedonic and utilitarian values, with hedonic value more strongly driving online purchase intention. Ribeiro (2024) noted that AI recommendations boost purchase intention more for utilitarian products, emphasizing the need to tailor AI feeds by product type. Live streaming e-commerce with AI personalization also increases engagement and purchase intention (Mei *et al.*, 2025). Additionally, Amazon's Echo Look AI device improves Gen Z's fashion purchase intention by enhancing satisfaction and trust through personalized style suggestions (Ruiz-Viñals *et al.*, 2024).

2.8 AI Quality

AI information quality, characterized by accuracy, relevance, completeness, and timeliness enhances consumer satisfaction, trust, and decision-making in online shopping (Lopes *et al.*, 2025). Both information and system quality contribute to overall AI recommendation quality, which boosts user satisfaction and promotes continued use and positive word-of-mouth (Kim & Kim, 2025). Additionally, AI quality, including information authenticity and system compliance, significantly increases Gen Z's satisfaction and brand advocacy (Elayat & Elalfy, 2025).

3. Research Methodology

3.1 Research Design

This study employs a quantitative research design, acting as a "conceptual blueprint" to investigate the influence of personalized AI on Generation Z's engagement in Penang (Akhtar, 2016; Creswell & Creswell, 2018). Rooted in a positivist philosophy, this approach focuses on collecting numerical data through structured survey techniques to objectively measure social reality and test hypotheses (Saunders *et al.*, 2023). As a cross-sectional survey method, the research utilizes a standardized questionnaire to gather data on consumer preferences and attitudes from a broad sample (Neuman, 2014; Check & Schutt, 2012). Data collection was facilitated via Google Forms, utilizing a 5-point Likert scale to assess respondent agreeability. This methodology enables the use of statistical analysis, specifically through SPSS, to identify trends, averages, and correlations between the independent and dependent variables (Bhandari, 2023).

3.2 Research Population and Sample

3.2.1 Research Population

According to Momoh (2025), the research population is the entire group sharing common characteristics from which a sample is drawn. In this study, the population focuses on Gen Z individuals from ages 15 to 29 residing in Penang, Malaysia, which has a population approximately 623,100 people as of 2024, about 35% of the total population of 1,800,500 in Penang.

3.2.2 Research Sampling

Sampling allows for statistical inferences about a population by analyzing a representative subset (Fleetwood, 2023). This study employs convenience sampling, a non-probability technique selected for its practical advantages in accessibility and resource efficiency (Bhardwaj, 2019; Galloway, 2005). This method facilitates the collection of insights from respondents who are readily available and willing to participate. Based on the Krejcie and Morgan (1970) sampling table, a sample size of 384 was determined to represent a population of 1,000,000 or more. The target respondents consist of Generation Z individuals residing in Penang, Malaysia, ensuring geographical and demographic relevance for data collection.

3.3 Data Collection

3.3.1 Primary Data

According to Kabir (2016), primary data is information gathered from firsthand experience. Primary data has yet to be released but is more trustworthy, objective, and authentic. Primary data sources are limited, and it might be difficult to get data from them at times due to either population scarcity or a lack of collaboration. Primary data can be obtained by experiments, questionnaires, interviews, surveys, or observation. Thus, the researcher has been using the primary source of individual such as provide questionnaires to the respondents in Penang, Malaysia for getting more information and to achieve the objective of this research.

3.4 Pilot Study

A pilot study was conducted as a small-scale feasibility test to evaluate the practicality, validity, and reliability of the research instruments (Lowe, 2019). The pilot test utilized Google Forms to monitor response times and gather participant feedback for refinement. Thus, a pilot test conducted on 30 randomly chosen respondents participated to the actual data collection process. Apart from that, a total of 384 questionnaires were collected as part of the pilot test to obtain replies and feedback on the questionnaire.

3.5 Research Instrument

3.5.1 Questionnaire

According to Roopa and Rani (2012), a questionnaire is a series of questions used to collect statistically useful information on a specific topic. The study utilizes a structured questionnaire to gather quantitative primary data on personalized AI's influence on Gen Z's engagement. The instrument is divided into three parts. Part A focus on demographic information like gender, age, education, and AI familiarity, part B consist of Personalized AI elements items, and part C consist item related to the consumers' engagement among Gen Z in Penang. The questionnaire is using 5-points Likert Scale.

3.6 Data Analysis

Data analysis involves examining and processing collected data to obtain useful information, solve problems, and determine if the study's objectives were met. At the study's conclusion, the questionnaire is reviewed to ensure its relevance to the objectives. The data was analyzed using Statistical Package for Social Science (SPSS). After respondents completed the survey, SPSS was used to analyze the data and generate tables and graphs, helping the researcher better understand the responses from the target participants.

3.6.1 Descriptive Statistical

Analysis Descriptive analysis was employed to summarize and visualize the dataset, enabling the identification of key patterns and trends (Rawat, 2021). In this study, the technique was applied to the demographic profiles and variable distributions using SPSS. Data were processed into frequencies, valid percentages, means, and standard deviations, with visual aids such as bar charts and histograms used for investigation. This systematic summary provides a clear overview of the respondents' backgrounds and ensures data integrity by identifying potential missing values.

3.6.2 Reliability Analysis

Reliability analysis is concerned with a scale's capacity to consistently represent the construct being assessed. Cronbach's alpha is an internal consistency metric that may also be used to evaluate scale dependability. Researchers have utilized Cronbach's Coefficient Alpha, which ranges between 0 and 1, to assess dependability. In this Cronbach's Coefficient Alpha technique, the greater the coefficient value, the more reliable the outcome is. For example, if the value in this study is 0.60 or above, it indicates reliability and internal consistency. If the value goes below 0.60, the consequence is the reverse. The Cronbach's Coefficient Alpha value appears in the table.

3.6.3 Pearson's Correlation Analysis

Pearson's correlation coefficient is a statistical measure that not only evaluates the strength but also direction of the relationship between AI networking recommendation, AI personalized feed and AI quality (Statistics Solutions, 2025). The coefficient ranges from -1 to +1, where positive values indicate a direct relationship and negative values signify an inverse relationship. This analysis statistically validates the linear connection between personalized AI elements and the dependent variable.

4. Analysis and Presentation Data

4.1 Introduction

This chapter presents the data analysis and discussion of results derived from the online questionnaire. Quantitative data gathered from Generation Z respondents in Penang were processed using SPSS to evaluate the research framework. The primary objective is to address the research questions and hypotheses through empirical evidence, ensuring the study's findings are statistically validated and supported by solid results.

4.2 Survey Return Rate

The population of Gen Z in Penang consists of 623,100 in 2024. According to Krejcie and Morgan (1970), 384 Gen Z in Penang are required. However, 317 sets of questionnaires returned from the 384 issued within Gen Z in Penang. Therefore, Table 1 shows that the questionnaire survey return rate was 82.55%, indicating that participants were willing to participate in this research study.

Table 1 *Survey Return Rate*

Return Rate Item	Description
Sample size	384
Questionnaires distributed	384
Questionnaires returned	317
Percentage	82.55%

4.3 Reliability Analysis

4.3.1 Reliability Test for Pilot Study

A pilot test involving 30 randomly selected respondents to assess the reliability of the study's variables as shown in Table 2. Total of 20 items were analyzed through reliability analysis in the pilot study. Results were above 0.60, which were accepted.

Table 2 *Reliability Analysis for Pilot Study*

Variables	Number of Respondents	Number of Items	Cronbach's Alpha Value
AI Networking Recommendation	30	5	0.915
AI Personalized Feed	30	5	0.870
AI Quality	30	5	0.759
Consumers' Engagement	30	5	0.647

4.3.2 Reliability Test for Actual Study

Table 3 summarizes the Cronbach's Alpha reliability test results for all variables based on 317 responses. The analysis yielded coefficients ranging from 0.851 to 0.901 for the independent variables and 0.874 for the dependent variable, with an overall instrument reliability of 0.881 across 20 items. As all values significantly exceed the acceptable threshold of 0.60 and fall within the "good" to "excellent" range (0.70–0.90), the internal consistency of the research instrument is statistically validated and accepted for further analysis.

Table 3 *Reliability Test for Actual Study*

Variables	Number of Items	N	Cronbach's Alpha Value
AI Networking Recommendation	5	317	0.898
AI Personalized Feed	5	317	0.851
AI Quality	5	317	0.901
Consumers' Engagement	5	317	0.874

4.4 Reliability Analysis

Descriptive analysis was used to organize and summarize of demographic data that collected from the questionnaire including gender, age, education and understanding of personalized AI. The section below showed the result.

4.4.1 Analysis of Demographic Profile

Table 4 showed that the survey of 317 respondents showed that the highest percentage of respondents were female (73.20%), and the largest group by age was the 20-22 years old category (48.30%). In section education, majority of the participants hold a Bachelor's degree (77.30%). Then, the largest group of participants in answering "More familiar" in section understanding of personalized AI is 38.80%.

Table 4 *Demographic Information of Respondents*

Demographic Information	Category	N=317	Percent (%)
Gender	Male	85	26.8
	Female	232	73.2
Age	13-16 years old	8	2.5
	17-19 years old	34	10.7
	20-22 years old	153	48.3
	23-25 years old	106	33.4
	26-28 years old	16	5.0
	29-32 years old	8	2.5
Education	Less than a Bachelor's degree	50	15.8
	Bachelor's degree	245	77.3
	Master's degree or above	22	6.9
Understanding of Personalized AI	Very unfamiliar	4	1.3
	Unfamiliar	19	6.0
	Generally familiar	119	37.5

More familiar	123	38.8
Very familiar	52	16.4

4.4.2 Analysis of the Level of Gen Z Engaging in Personalized AI and the Level of Consumers' Engagement in E-commerce

Table 5 indicates the average mean of each dimension for the questionnaire. The results showed that the AI quality obtained the highest mean, which is 4.2486 with a standard deviation of 0.74598 and then followed by the second-highest mean AI personalized feed with 4.0927 and a standard deviation of 0.71696. From this result, we can know that the highest mean elements that affects the level of consumers' engagement was AI quality and AI personalized feed. The AI networking recommendation was the lowest mean, which is 4.0454 with a standard deviation of 0.85932. Meanwhile, consumers' engagement had the mean score of 4.0833 with a standard deviation of 0.71344.

Table 5 Summary of Analysis Average Mean of Each Dimension

Personalized AI Elements	N	Mean	Standard Deviation
AI Networking Recommendation	317	4.05	0.859
AI Personalized Feed	317	4.09	0.717
AI Quality	317	4.25	0.746
Consumers' Engagement	317	4.08	0.713

4.5 Correlation Analysis

Pearson's correlation analysis revealed significant positive relationships between all independent variables and consumers' engagement ($p < .001$). Table 6 shows that AI Personalized Feed exhibited the strongest association ($r = 0.729$), followed by AI Quality ($r = 0.784$), both indicating strong positive correlations. AI Networking Recommendation showed a moderate to strong association ($r = 0.484$). These results suggest that while all factors are critical, tailored content feeds and system reliability are the primary drivers of active engagement among Generation Z consumers in the e-commerce sector.

Table 6 Pearson's Correlation Analysis between Independent Variables and Consumers' Engagement

Pearson Correlation	Independent Variables	Consumers' Engagement (Correlation Coefficient)	Sig. (2-tailed)
	AI Networking Recommendation	0.484**	<.001
	AI Personalized Feed	0.729**	<.001
	AI Quality	0.784**	<.001

4.6 The Relationship Between Personalized AI Elements and Consumers' Engagement

4.6.1 AI Networking Recommendation

Fig.1 shows a moderate positive relationship between AI networking recommendation and consumer engagement, showing a linear upward trend ($y = 2.46 + 0.4x$) with a coefficient of determination $R^2 = 0.234$ or $r = 0.484$, consistent with the Pearson's correlation value.

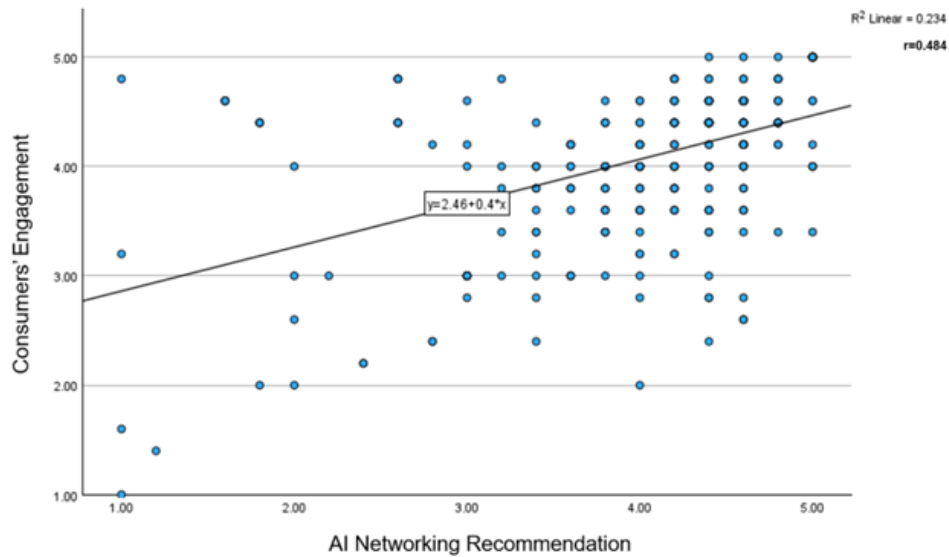


Fig.1 *AI Networking Recommendation*

4.6.2 AI Personalized Feed

Fig. 2 shows a significant positive relationship between AI networking recommendation and consumer engagement, showing a linear upward trend ($y = 1.12 + 0.73x$) with a coefficient of determination $R^2 = 0.531$ or $r = 0.729$, consistent with the Pearson's correlation value.

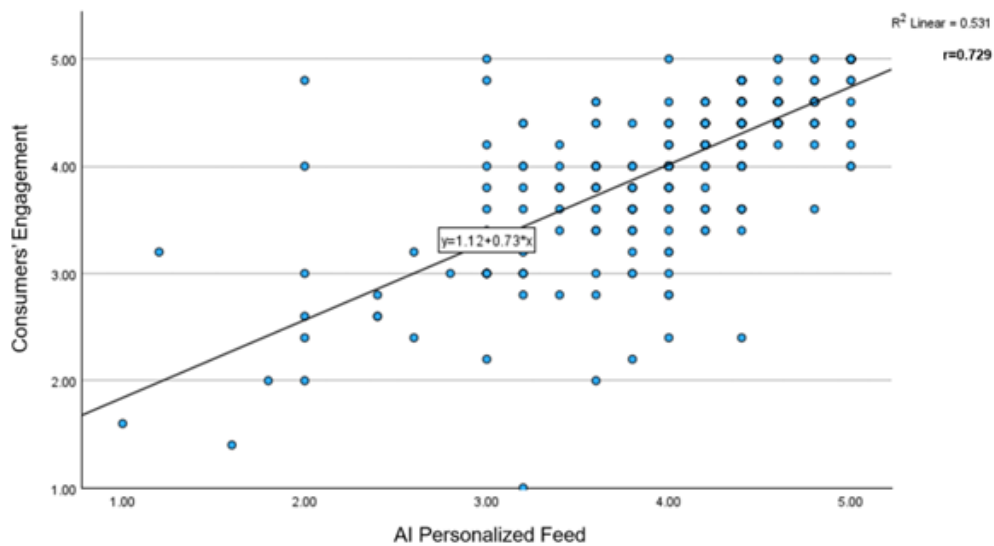


Fig.2 *AI Personalized Feed*

4.6.3 AI Quality

Fig. 3 shows a significant positive relationship between AI networking recommendation and consumer engagement, showing a linear upward trend ($y = 0.9 + 0.75x$) with a coefficient of determination $R^2 = 0.615$ or $r = 0.784$, consistent with the Pearson's correlation value.

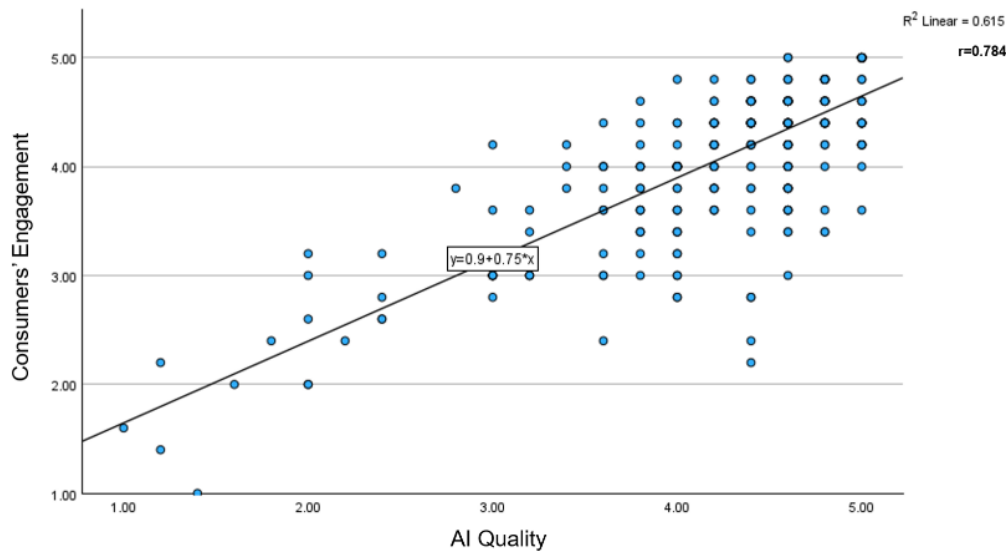


Fig.3 AI Quality

5. Conclusion

This research investigated the influence of personalized AI on Generation Z's engagement within Malaysia's rapidly evolving e-commerce sector. By employing a quantitative methodology, the study analyzed 317 valid responses from digital natives in Penang to address three primary objectives: evaluating the adoption levels of AI elements, measuring consumer engagement, and examining the relationship between these variables. The findings underscore the necessity for e-commerce platforms to align their technological strategies with the specific digital preferences of this demographic to remain competitive in the modern digital economy.

The empirical results confirm that both AI Quality and AI Personalized Feeds exert a significant positive influence on consumer engagement. Notably, AI quality characterized by accuracy, responsiveness, and interactivity, emerged as the strongest predictor of active behavioral and cognitive involvement. While this study provides valuable strategic insights for e-commerce merchants and digital marketers to refine their AI-driven offerings, it also acknowledges geographical and sampling limitations. Ultimately, these findings serve as a foundational resource for future research to further explore the evolving socio-technical dynamics between artificial intelligence and the next generation of consumers.

Acknowledgement

The authors would like to thank the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia for its support.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Yeo Zi Xwan and R. Chandrashekar; **data collection:** Y.Z.X. and R.C.; **analysis and interpretation of results:** Yeo Zi Xwan; **draft manuscript preparation:** Yeo Zi Xwan and R. Chandrashekar. All authors reviewed the results and approved the final version of the manuscript.

References

- Abbas, A., Khan, I., Din, A., & Shazaib, M. (2020). Impact of Advertising on Consumer Purchase Intention: A Study of Southern Punjab. *European Journal of Business and Management*. <https://doi.org/10.7176/ejbm/12-19-01>
- Akhtar, M. I. (2016). *Research Design*. <https://www.researchgate.net/publication/308915548>
- Arghashi, V., & Gunalay, Y. (2025). Exploring the metaverse: what drives millennials and Gen Z to embrace virtual worlds? *Journal of Islamic Marketing*. <https://doi.org/10.1108/JIMA-12-2024-0574>
- Attar, R. W. (2025). Predicting Trends and Maximizing Sales: AI's Role in Saudi E-Commerce Decision-Making. *Journal of Theoretical and Applied Electronic Commerce Research*, 20(4), 311. <https://doi.org/10.3390/jtaer20040311>

- Beyari, H., & Hashem, T. (2025). The Role of Artificial Intelligence in Personalizing Social Media Marketing Strategies for Enhanced Customer Experience. *Behavioral Sciences*, 15(5). <https://doi.org/10.3390/bs15050700>
- Bhandari, P. (2023, June 22). *What is quantitative research? | Definition, uses & methods*. Scribbr. <https://www.scribbr.com/methodology/quantitative-research/>
- Bhardwaj, P. (2019). *Types of sampling in research*. Journal of the Practice of Cardiovascular Sciences. https://doi.org/10.4103/jpcs.jpcs_62_19
- BigCommerce. (2021). *How Ecommerce AI is Transforming Business*. <https://www.bigcommerce.com/articles/ecommerce/ecommerce-ai/>
- Bilal, M., Zhang, Y., Cai, S., Akram, U., & Halibas, A. (2024). Artificial intelligence is the magic wand making customer-centric a reality! An investigation into the relationship between consumer purchase intention and consumer engagement through affective attachment. *Journal of Retailing and Consumer Services*, 77. <https://doi.org/10.1016/j.jretconser.2023.103674>
- Cao, N., Isa, N. M., Perumal, S., & Chen, C. (2025). Perceived Value, Consumer Engagement, and Purchase Intention in Virtual Influencer Marketing: The Role of Source Credibility and Generational Cohort. *Journal of Theoretical and Applied Electronic Commerce Research*, 20(2). <https://doi.org/10.3390/jtaer20020150>
- Check, J., & Schutt, R. (2012). *Research methods in education*. SAGE Publications. https://books.google.com.my/books/about/Research_Methods_in_Education.html?id=nSWYAAAAQBAJ&redir_esc=y
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and Mixed Methods Approaches (5th ed.)*. https://spada.uns.ac.id/pluginfile.php/510378/mod_resource/content/1/creswell.pdf
- Deloitte. (2023). *Digital life often delivers daily benefits, but can also fuel tech fatigue and well-being worries*. Deloitte Insights. <https://www2.deloitte.com/us/en/insights/industry/telecommunications/connectivity-mobile-trends-survey/2023/connected-consumers-digital-fatigue.html>
- Deloitte. (2025). 2025 Gen Z and Millennial Survey. *Deloitte Global*. <https://www.deloitte.com/global/en/issues/work/genz-millennial-survey.html>
- Ding, L., Antonucci, G., & Venditti, M. (2024). Unveiling user responses to AI-powered personalised recommendations: a qualitative study of consumer engagement dynamics on Douyin. *Qualitative Market Research*. <https://doi.org/10.1108/QMR-11-2023-0151>
- Dragolea, L. L., Butnaru, G. I., Kot, S., Zamfir, C. G., Nuță, A. C., Nuță, F. M., Cristea, D. S., & Ștefănică, M. (2023). Determining factors in shaping the sustainable behavior of the generation Z consumer. *Frontiers in Environmental Science*, 11. <https://doi.org/10.3389/fenvs.2023.1096183>
- Elayat, A. M. A., & Elalfy, R. M. (2025). Using SOR theory to examine the impact of AI Chatbot quality on Gen Z's satisfaction and advocacy within the fast-food sector. *Young Consumers*, 26(2), 352–383. <https://doi.org/10.1108/YC-08-2024-2199>
- Fleetwood, D. (2023). *Sampling Methods: Techniques & Types with Examples*. QuestionPro. <https://www.questionpro.com/blog/types-of-sampling-methods/>
- Galloway, A. (2005). *Non-Probability Sampling*. <https://doi.org/10.1016/B0-12-369398-5/00382-0>
- Gao, B., Wang, Y., Xie, H., Hu, Y., & Hu, Y. (2023). Artificial Intelligence in Advertising: Advancements, Challenges, and Ethical Considerations in Targeting, Personalization, Content Creation, and Ad Optimization. In *SAGE Open* (Vol. 13, Issue 4). SAGE Publications Inc. <https://doi.org/10.1177/21582440231210759>
- Gao, Y., & Liu, H. (2023). Artificial intelligence-enabled personalization in interactive marketing: a customer journey perspective. *Journal of Research in Interactive Marketing*, 17(5), 663–680. <https://doi.org/10.1108/JRIM-01-2022-0023>
- Gerlich, M. (2025). The Shifting Influence: Comparing AI Tools and Human Influencers in Consumer Decision-Making. *AI (Switzerland)*, 6(1). <https://doi.org/10.3390/ai6010011>
- Guo, W., & Luo, Q. (2023). Investigating the impact of intelligent personal assistants on the purchase intentions of Generation Z consumers: The moderating role of brand credibility. *Journal of Retailing and Consumer Services*, 73. <https://doi.org/10.1016/j.jretconser.2023.103353>
- Gupta, Y. (2025). *The impact of AI and chatbots in influencing the GenZ Consumer engagement and retention*.
- Hasim, M. A., & Nazri, S. N. A. M. (2025). The Role of Mobile Application Design, Branding, AI-Driven Personalization, and Social Commerce Integration on Purchase Intention Among Generation Z: The Mediating Role of Mobile App Marketing. *Paper Asia*, 41(1), 317–329. <https://doi.org/10.59953/paperasia.v41i1b.371>
- Hassan, N., Abdelraouf, M., & El-Shihy, D. (2025). The moderating role of personalized recommendations in the trust–satisfaction–loyalty relationship: an empirical study of AI-driven e-commerce. *Future Business Journal*, 11(1), 66. <https://doi.org/10.1186/s43093-025-00476-z>
- Herzallah, F., Abosamaha, A. J., Abu-Siam, Y., Amer, M., Sajjad, U., & Hamid, K. (2025). Determinants of mobile wallet usage among Gen Z: Extending the UTAUT2 model with moderating effects of personal innovativeness and

- gender. *International Journal of Information Management Data Insights*, 5(1). <https://doi.org/10.1016/j.jjimei.2025.100336>
- Holban, C., & Bedrule-Grigoruță, M. V. (2025). Talent Management Strategies for Generation Z: An Exploratory Study in Romanian Organizations. *Studies in Business and Economics*, 20(1), 304–318. <https://doi.org/10.2478/sbe-2025-0018>
- Hovořáková, E., & Pauknerová, D. (2024). Model And Specifics Of Generation Z Entry Onto The Czech Labour Market. *Central European Business Review*, 13(3), 1–29. <https://doi.org/10.18267/J.CEBR.349>
- IONIȚĂ, C.-G., LEOVARIDIS, C., & POPESCU, G. (2025). Use of Artificial Intelligence in Advertising Agencies: Opportunities and Challenges. *Management Dynamics in the Knowledge Economy*, 13(1), 38–51. <https://doi.org/10.2478/mdke-2025-0003>
- Jayasingh, S., Sivakumar, A., & Vanathaiyan, A. A. (2025). Artificial Intelligence Influencers' Credibility Effect on Consumer Engagement and Purchase Intention. *Journal of Theoretical and Applied Electronic Commerce Research*, 20(1). <https://doi.org/10.3390/jtaer20010017>
- Joshi, H. (2025). Integrating trust and satisfaction into the UTAUT model to predict Chatbot adoption – A comparison between Gen-Z and Millennials. *International Journal of Information Management Data Insights*, 5(1). <https://doi.org/10.1016/j.jjimei.2025.100332>
- Kabir, S. (2016). *Methods Of Data Collection*. ResearchGate. https://www.researchgate.net/publication/325846997_Methods_Of_Data_Collection
- Kim, S. Y., & Kim, J. (2025). The impact of AI recommendation quality on service satisfaction: the moderating roles of standardization and customization. *Journal of Services Marketing*. <https://doi.org/10.1108/JSM-05-2024-0214>
- Kim, T., & Im, I. (2025). Understanding users' AI manipulation intention: An empirical investigation of the antecedents in the context of AI recommendation algorithms. *Information and Management*, 62(1). <https://doi.org/10.1016/j.im.2024.104061>
- KPMG. (2019). *Initiate your journey to unlock data's full potential*.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607–610.
- Lim, C. V., Zhu, Y. P., Omar, M., & Park, H. W. (2024). Decoding the Relationship of Artificial Intelligence, Advertising, and Generative Models. In *Digital* (Vol. 4, Issue 1, pp. 244–270). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/digital4010013>
- Liu, G. G., Lv, L., Meng, L. L., & Tao, J. (2026). Beyond algorithms: How socio-technical antecedents drive social-exchange outcomes in AI travel planning personalization. *Journal of Retailing and Consumer Services*, 89. <https://doi.org/10.1016/j.jretconser.2025.104607>
- Liu, Z., Cheon, S., Stanbury, A., Jiao, X., Xing, W., & Kang, H. (2025). Towards contextual-based AI: A scoping review of artificial intelligence in X reality for personalized learning. *Computers and Education: Artificial Intelligence*, 100523. <https://doi.org/10.1016/j.caeai.2025.100523>
- Lopes, J. M., Massano-Cardoso, I., & Granadeiro, C. (2025). Festivals in Age of AI: Smarter Crowds, Happier Fans. *Tourism and Hospitality*, 6(1). <https://doi.org/10.3390/tourhosp6010035>
- Lowe, N. K. (2019). What Is a Pilot Study? *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 48, 117–118. <https://doi.org/10.1186/1471-2288/10/67>
- Maemunah, S., Diva Permatasari Marzuki, C., & Prayoga, D. (2025). Artificial Intelligence and E-Service Quality Enhance E-Commerce Customer Satisfaction Among Gen Z. In *Asian Journal of Social Science and Management Technology* (Vol. 7, Issue 1). www.ajssmt.com
- Mei, L., Tang, N., Zeng, Z., & Shi, W. (2025). Artificial Intelligence Technology in Live Streaming E-commerce: Analysis of Driving Factors of Consumer Purchase Decisions. *International Journal of Computers, Communications and Control*, 20(1). <https://doi.org/10.15837/ijccc.2025.1.6871>
- Merge. (2024). *Gen Z, AI, and Personalization Trending In 2024*. <https://www.mergeworld.com/insights/consumer/gen-z-ai-and-personalization-highlight-nrf-2024>
- Momoh, O. (2025, April 30). *Population: Definition in Statistics and How to Measure It*. <https://www.investopedia.com/terms/p/population.asp>
- Neuman, W. Lawrence. (2014). *Social research methods: qualitative and quantitative approaches*. Pearson. https://letrunghieutvu.yolasite.com/resources/w-lawrence-neuman-social-research-methods_-qualitative-and-quantitative-approaches-pearson-education-limited-2013.pdf
- Ngo, T. T. A., Nguyen, H. L. T., Mai, H. T. A., Nguyen, H. P., Mai, T. H. T., & Hoang, P. L. (2025). Analyzing the role of customers' experiences and emotional responses in shaping Generation Z's impulse buying behavior on Shopee video platform. *PLoS ONE*, 20(5 May). <https://doi.org/10.1371/journal.pone.0322866>
- O'Brien, K., & Downie, A. (2024). *What is customer engagement?*
- Penang Institute. (2024). *Population and Demographics*. Key Penang Statistics: Penang Institute. <https://statistics.penanginstitute.org/dashboards/social/pop.html>

- Pendyala, M. K., & Lakkamraju, V. V. (2024). Impact of Artificial Intelligence in Customer Journey. *International Journal of Innovative Science and Research Technology (IJISRT)*, 1528–1534. <https://doi.org/10.38124/ijisrt/ijisrt24aug807>
- Prensky, M. (2001). *Digital Natives, Digital Immigrants* (Vol. 9, Issue 5). MCB University Press.
- Prentice, C., Weaven, S., & Wong, I. K. A. (2020). Linking AI quality performance and customer engagement: The moderating effect of AI preference. *International Journal of Hospitality Management*, 90. <https://doi.org/10.1016/j.ijhm.2020.102629>
- Priporas, C. V., Hussain, S., & Rahman, H. (2025). The effects of AI-generated advertisements on customer engagement and emotions based on Hofstede's cultural dimensions: a study from the generation Z international optic. *International Marketing Review*. <https://doi.org/10.1108/IMR-10-2024-0433>
- Prova, N. N. I., Ravi, V., Singh, M. P., Srivastava, V. K., Chippagiri, S., & Singh, A. P. (2026). Multilingual sentiment analysis in e-commerce customer reviews using GPT and deep learning-based weighted-ensemble model. *International Journal of Cognitive Computing in Engineering*, 7(1), 268–286. <https://doi.org/10.1016/j.ijcce.2025.10.003>
- PwC. (2024). *Voice of the Consumer Survey 2024: Shrinking the consumer trust deficit*. <https://www.pwc.com/gx/en/issues/c-suite-insights/voice-of-the-consumer-survey.html>
- Qadri, U. A., Ahmed Moustafa, A. M., & Waqas, M. (2026). When and how AI personalization drives sustainable purchases: The roles of relevance, privacy, and transparency in eco-friendly advertising. *Journal of Retailing and Consumer Services*, 89. <https://doi.org/10.1016/j.jretconser.2025.104592>
- Rahayu, F. S., Nastiti, P., & Arthajanjian, T. (2025). The Role of Hedonic Motivation in Influencing TikTok Use and How It Relates to Generation Z Characteristics. *Advances in Human-Computer Interaction*, 2025(1). <https://doi.org/10.1155/ahci/5971465>
- Rahman, W. (2026). Ethical AI personalization in digital retail: The roles of transparency, privacy, and consumer trust. *Strategic Business Research*, 2(1), 100020. <https://doi.org/10.1016/j.sbr.2025.100020>
- Rawat, A. S. (2021, March 31). *An Overview of Descriptive Analysis*. Analytic Steps. <https://www.analyticssteps.com/blogs/overview-descriptive-analysis>
- Ribeiro, F. (2024). *AI Recommendations: Impact of Product Type and Number of Options on Users' Purchase Intention and Attitude Toward the Brand*. <https://www.proquest.com/docview/3110417029/C41B522C99724495PQ/3?accountid=50362&sourcetyp=Disserations%20&%20Theses>
- Roopa, S., & Rani, M. (2012). Questionnaire Designing for a Survey. *The Journal of Indian Orthodontic Society*, 46, 273–277. <https://doi.org/10.5005/jp-journals-10021-1104>
- Ruiz-Viñals, C., Pretel-Jiménez, M., Del Olmo Arriaga, J. L., & Miró Pérez, A. (2024). The Influence of Artificial Intelligence on Generation Z's Online Fashion Purchase Intention. *Journal of Theoretical and Applied Electronic Commerce Research*, 19(4), 2813–2827. <https://doi.org/10.3390/jtaer19040136>
- Salsabila, S., & Legowo, N. (2025). The Impact Of Ai Generated Content To Incease Customer Engagement On Social Media. *Journal of Theoretical and Applied Information Technology*, 15(17). www.jatit.org
- Saunders, M., Lewis, P., & Thornhill, A. (2023). *Research methods for business students (9th ed.)*.
- Sidharta, C., Chandra, J., Putra, N. A., & Karsen, M. (2024). Analysis of AI's Impact on Purchase Intention on Social Media Platforms. *2024 2nd International Conference on Technology Innovation and Its Applications (ICTIIA)*, 1–6. <https://doi.org/10.1109/ICTIIA61827.2024.10761585>
- Statista. (2025, December 17). *Artificial intelligence (AI) in e-commerce - statistics & facts*. <https://www.statista.com/topics/11640/artificial-intelligence-and-extended-reality-in-e-commerce/?srsltid=AfmBOor1Wzv9JM7S1pbE3MlBMi8NaZwbWy63NjnyHdhaWqsK5DC8Etj>
- Statista Market Forecast. (2024). *eCommerce - Malaysia | Statista Market Forecast*. Statista Market Forecast. <https://www.statista.com/outlook/emo/ecommerce/malaysia>
- Statistics Solutions. (2025). *Pearson's Correlation Coefficient: A Comprehensive Overview*. <https://www.statisticssolutions.com/free-resources/directory-of-statistical-analyses/pearsons-correlation-coefficient/>
- Suganya, G., Premalatha, M., Dubey, P., Drolia, A. R., & Srihari, S. (2020). Subjective areas of improvement: A personalized recommendation. *Procedia Computer Science*, 172, 235–239. <https://doi.org/10.1016/j.procs.2020.05.037>
- Swaminathan, R. (2022, September 22). *What does Generation Z expect from work?* World Economic Forum. <https://www.weforum.org/stories/2022/09/the-4-expectations-gen-z-teams-have-workplace-future/>
- Tauheed, J., Shabbir, A., & Pervez, M. S. (2024). Exploring the Role of Artificial Intelligence in Digital Marketing Strategies. *Journal of Business, Communication & Technology*, 54–65. <https://doi.org/10.56632/bct.2024.3105>
- Teepapal, T. (2025). AI-driven personalization: Unraveling consumer perceptions in social media engagement. *Computers in Human Behavior*, 165. <https://doi.org/10.1016/j.chb.2024.108549>

- Theocharis, D., & Tsekouropoulos, G. (2025). Sustainable Consumption and Branding for Gen Z: How Brand Dimensions Influence Consumer Behavior and Adoption of Newly Launched Technological Products. *Sustainability (Switzerland)*, 17(9). <https://doi.org/10.3390/su17094124>
- Trang, T. T. N., Thang, P. C., Nguyen, G. T. T., & Nguyen, H. T. M. (2025). Factors driving Gen Z's news engagement on TikTok: A hybrid analysis through CB-SEM and PLS-SEM. *Computers in Human Behavior Reports*, 18. <https://doi.org/10.1016/j.chbr.2025.100645>
- Turki, H. (2025). AI-powered personalization in e-commerce: Governance, consumer behavior, and exploratory insights from big data analytics. *Technology in Society*, 83. <https://doi.org/10.1016/j.techsoc.2025.103033>
- Wang, W., Chen, Z., & Kuang, J. (2025). Artificial Intelligence-Driven Recommendations and Functional Food Purchases: Understanding Consumer Decision-Making. *Foods*, 14(6). <https://doi.org/10.3390/foods14060976>
- Woolard, A. (2025). *How AI in Customer Engagement Transforms CX: 5 Proven Strategies*. <https://www.bloomreach.com/en/blog/how-ai-technology-will-transform-customer-engagement>
- Yin, J., & Qiu, X. (2021). Ai technology and online purchase intention: Structural equation model based on perceived value. *Sustainability (Switzerland)*, 13(10). <https://doi.org/10.3390/su13105671>
- Yin, J., Qiu, X., & Wang, Y. (2025). The Impact of AI-Personalized Recommendations on Clicking Intentions: Evidence from Chinese E-Commerce. *Journal of Theoretical and Applied Electronic Commerce Research*, 20(1). <https://doi.org/10.3390/jtaer20010021>
- Zhang, W., Liu, F., Xu, D., & Jiang, L. (2019). Recommendation system in social networks with topical attention and probabilistic matrix factorization. *PLoS ONE*, 14(10). <https://doi.org/10.1371/journal.pone.0223967>
- Ziakis, C., & Vlachopoulou, M. (2023). Artificial Intelligence in Digital Marketing: Insights from a Comprehensive Review. *Information (Switzerland)*, 14(12). <https://doi.org/10.3390/info14120664>